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(54) **SEAMLESS MIGRATION OF A NETWORK MANAGEMENT SYSTEM DEPLOYMENT TO CLOUD-BASED DEPLOYMENT**

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G06F 21/64	(2013.01)
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H04L 67/00	(2022.01)

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(58) **Field of Classification Search**

CPC H04L 67/148; H04L 67/34; H04L 67/40

See application file for complete search history.

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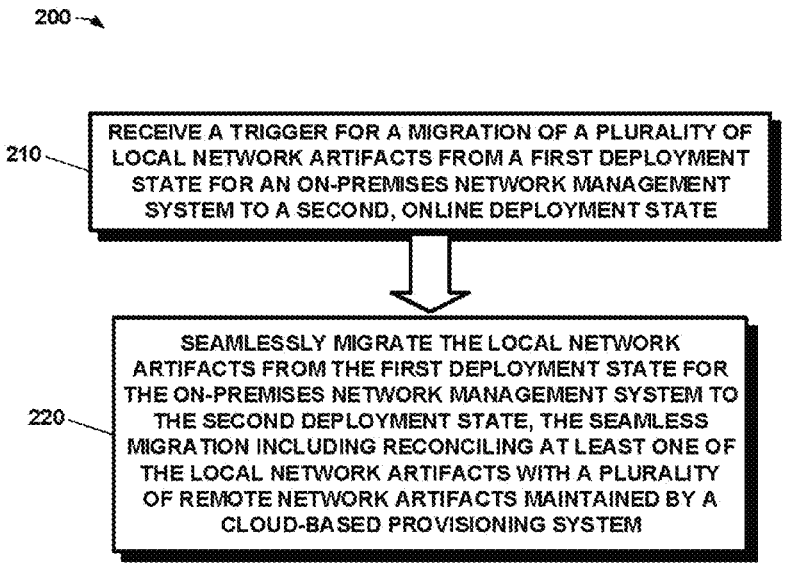
(57) **ABSTRACT**

A method for use in managing a networked computing system includes: receiving a trigger for a migration of a plurality of local migration artifacts from a first deployment state associated with an on-premises network management system to a second deployment state; and migrating the plurality of local migration artifacts from the first deployment state associated with the on-premises network management system to the second deployment state associated with the cloud-based provisioning system. The migration is seamless and includes reconciling at least one local migration artifact of the plurality of local migration artifacts with a plurality of remote migration artifacts maintained by the cloud-based provisioning system.

20 Claims, 4 Drawing Sheets



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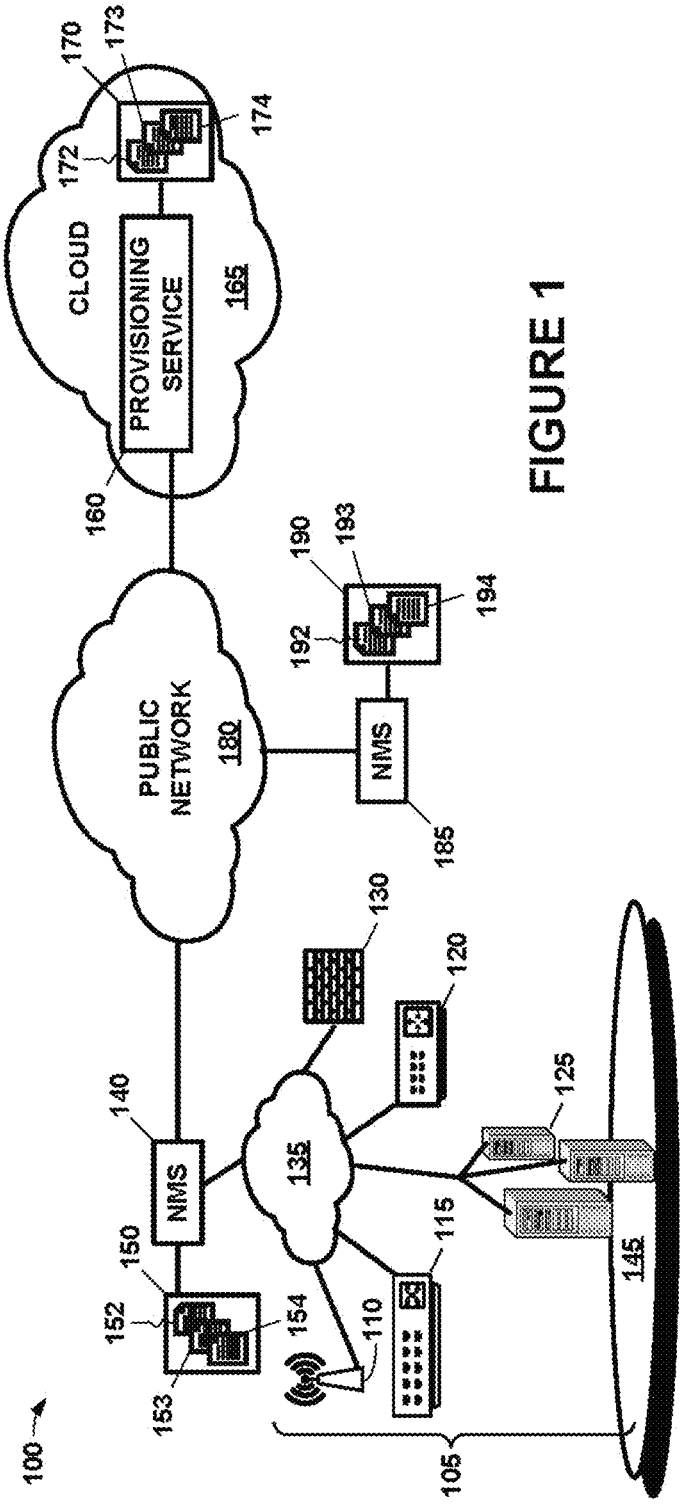
100
105
110
115
120
125
130
135
140
145
150
152
153
154
160
165
170
172
173
174
180
185
190
192
193
194
CLOUD
PROVISIONING SERVICE
PUBLIC NETWORK
NMS
NMS

FIGURE 1

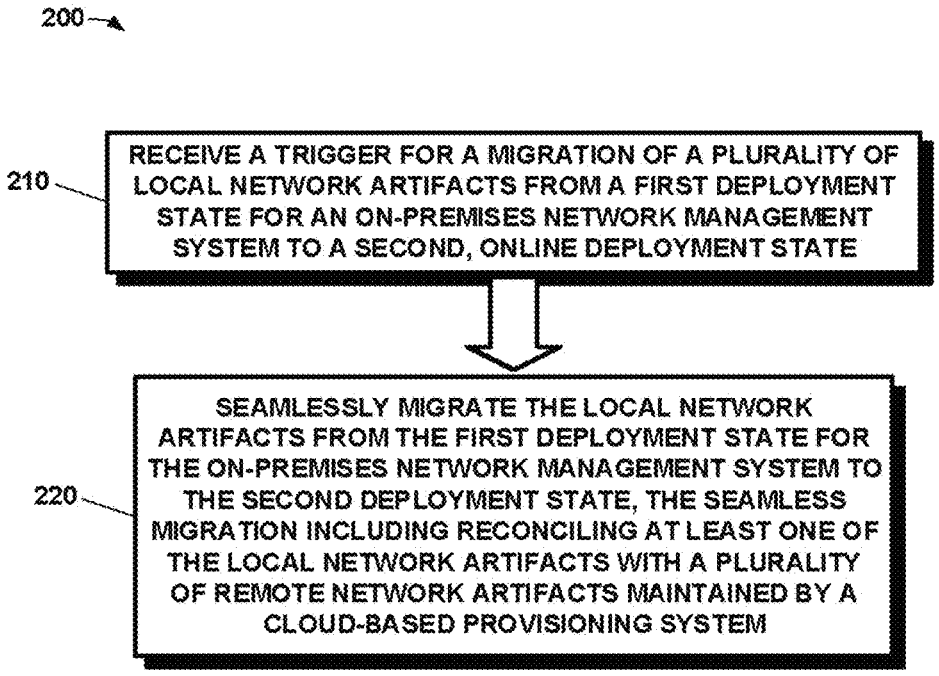

FIGURE 2

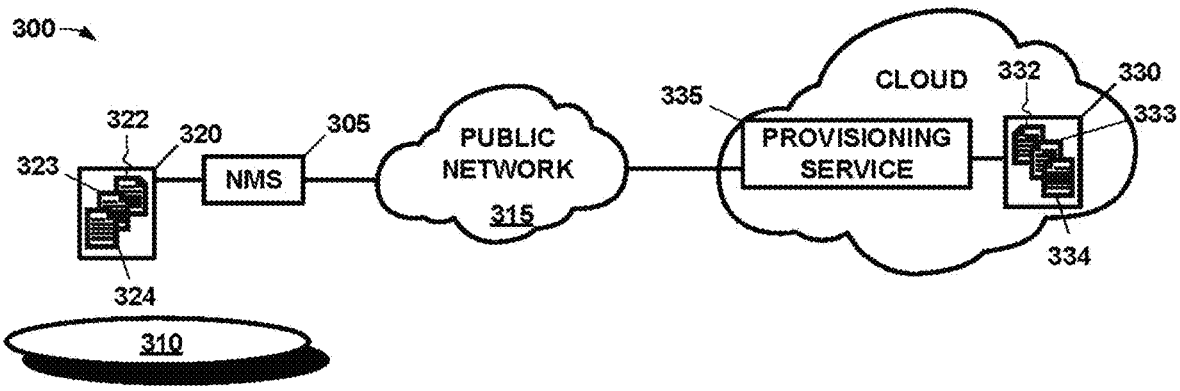

FIGURE 3

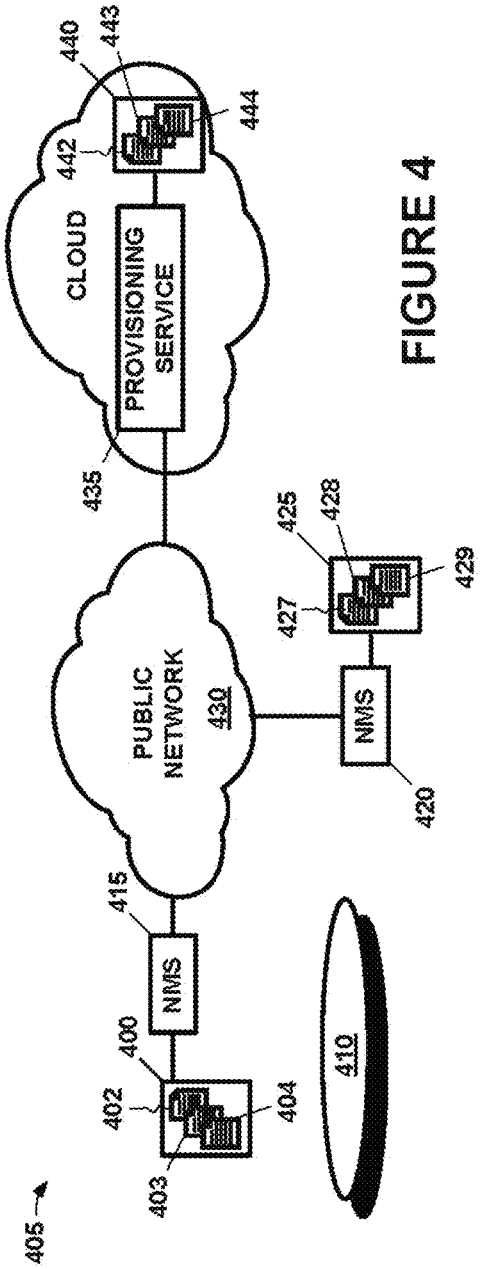

FIGURE 4

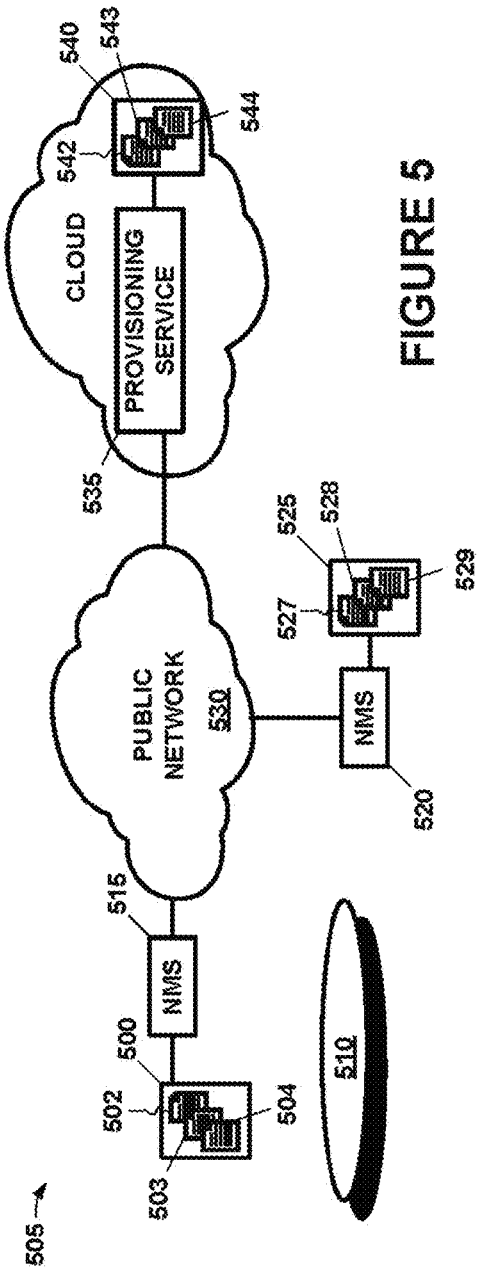

FIGURE 5

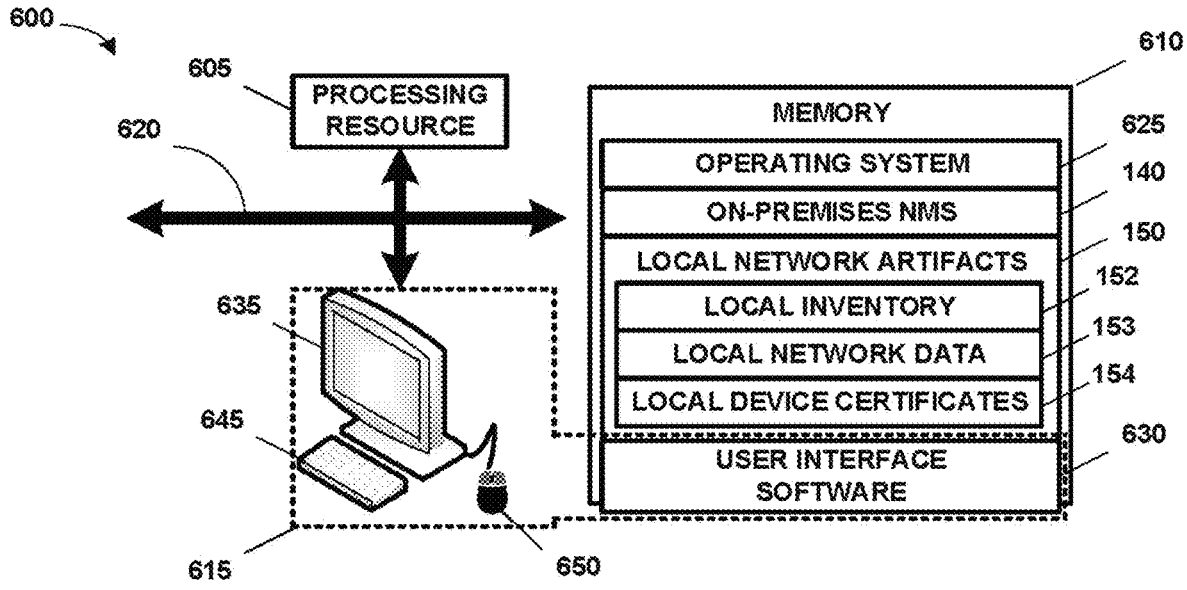
600
605
PROCESSING RESOURCE
620
610
MEMORY
625
OPERATING SYSTEM
140
ON-PREMISES NMS
150
LOCAL NETWORK ARTIFACTS
152
LOCAL INVENTORY
153
LOCAL NETWORK DATA
154
LOCAL DEVICE CERTIFICATES
630
USER INTERFACE SOFTWARE
635
645
615
650

FIG. 6

SEAMLESS MIGRATION OF A NETWORK MANAGEMENT SYSTEM DEPLOYMENT TO CLOUD-BASED DEPLOYMENT

BACKGROUND

Network management systems gather and store large amounts of information associated with the operation of associated computing systems. For instance, operational data may be logged and eventually archived as may data regarding configurations and settings for network devices. The network management systems also typically include inventories of network devices in the computing system, data associated with the configuration of the network devices, and device certificates for the network devices.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may be understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements, and in which:

FIG. **1** depicts selected portions of a network management system deployed and migrated in accordance with one or more examples of the subject matter claimed below.

FIG. **2** illustrates a method by which the seamless migration of the network management system, may be performed in some examples.

FIG. **3** depicts selected portions of a network management system deployed and migrated in accordance with one or more examples of the subject matter claimed below.

FIG. **4** depicts selected portions of a network management system, deployed and migrated in accordance with one or more examples of the subject matter claimed below.

FIG. **5** depicts selected portions of a network management system deployed and migrated in accordance with one or more examples of the subject matter claimed below is shown.

FIG. **6** illustrates selected portions of a hardware and software architecture of an administrative console as may be used in one or more examples.

While the invention is susceptible to various modifications and alternative forms, the drawings illustrate specific embodiments herein described in detail by way of example. It should be understood, however, that the description herein of specific embodiments is not intended to limit the invention to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION

Illustrative examples of the subject matter claimed below will now be disclosed. In the interest of clarity, not all features of an actual implementation are described in this specification. It will be appreciated that in the development of any such actual implementation, numerous implementation-specific decisions may be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort, even if complex and time-consuming, would be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure.

The present disclosure provides a technique that seamlessly migrates migration artifacts from a first deployment state for an on-premises network management system ("NMS") to a second, deployment state. In the present context, "seamless" means without the need for user interaction or input once the migration is triggered. The on-premises network management system may be "offline" or "online". "Offline" in this context means the network management system is self-contained within the premises without access to a public network. "Online" in this context means the network management system has access to a public network. The public network may be, for example, the Internet and, more particularly, the World Wide Web of the Internet.

The online deployment state may be on-premises or off-premises (for example, in a cloud-based deployment). "On-premises" in this context means that the network management system resides in the same facility—or "premises"—as the network devices that it is managing. That is, "on-premises" describes the condition of being co-located with where the core networking infrastructure is deployed. "Off-premises" in this context means that the network management system resides in a facility—or premises—other than the one in the network devices that it is managing reside. Thus, "off-premises" describes the condition of not being co-located with where the core networking infrastructure is deployed. One example of "off-premises" alluded to above is a cloud hosted on a computing system that is housed in a different facility (e.g., a data center) from the facility in which the managed network's network devices reside.

In some examples, the first deployment state may be offline and on-premises and the second deployment state may be online and on-premises. In other examples, the first deployment state may be on-premises and offline while the second deployment state may be online and off-premises. In still other examples, the first deployment state may be, online and on-premises and the second deployment state may be online and off-premises.

The seamless migration includes a reconciliation of "migration artifacts". Migration artifacts in the present context include all the entities that are present and maintained by the network management system in a database kept for that purpose and that can be migrated to a different deployment. Migration artifacts may include, for instance, a device inventory of the network devices that the network management system is managing, certificates that the network management system will be providing to the network devices, monitoring statistics about the network devices that network management system is managing, alerts and syslog messages that have been issued by the network management system, and any other data that network management system has about the devices it is managing. The device inventory is a list of the network devices in the computing system that the on-premises network management system manages. The device inventory is maintained by the on-premises network management system as a part of, its management responsibilities.

The reconciliation is between the migration artifacts of the on-premises network management, system and their counterparts maintained on a cloud-based provisioning service used in the management of the network. This reconciliation ordinarily is performed by the client who owns the on-premises network management system and involves extensive, tedious, comparison of records and acquisition of information. Making the reconciliation a part of the seamless migration not only eases the burden of the reconciliation

from the client, it also promotes accuracy and minimizes loss of migration artifacts during the migration. The types of reconciliation to be performed depend on whether the on-premises network management system is offline and online and whether the cloud-based network management system is online or cloud-deployed.

More particularly, in some examples, a method for use in managing a networked computing system, includes: receiving a trigger for a migration of a plurality of local migration artifacts from a first deployment state, associated with an on-premises network management system to a second deployment state; and migrating the plurality of local migration artifacts from the first deployment state associated with the on-premises network management system to the second deployment state associated with the cloud-based provisioning system. The migration is seamless and includes reconciling at least one local migration artifact of the plurality of local migration artifacts with a plurality of remote migration artifacts maintained by the cloud-based provisioning system. The local migration artifact may include at least one of a device inventory of a plurality of network devices managed by the on-premises network management system, certificates that the on-premises network management system will be providing to the network devices, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, and syslog messages that have been issued by the network management system.

In another example a networked computing system includes: a plurality of network devices; a plurality of local migration artifacts; an on-premises network management system that, in operation, manages the plurality of network devices and includes and maintains the plurality of local migration artifacts; and a software component that, upon receiving a trigger, seamlessly migrates the plurality of local migration artifacts from a first deployment state associated with the on-premises network management system to a second deployment state. The seamless migration includes reconciling at least one local migration artifact of the plurality of local migration artifacts with a remote migration artifact of a plurality of remote migration artifacts maintained by a cloud-based provisioning system. The at least one local migration artifact may include at least one of a device inventory of the network devices managed by the on-premises network management system, certificates that the on-premises network management system will be providing to the network devices, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, and syslog messages that have been issued by the network management system.

In still another example, a computing apparatus includes: a processing resource; a bus system; and a memory that, in operation, communicates with the processing resource over the bus system and is encoded with instructions that, when executed by the processing resource over the bus system, cause the processing resource to: receive a trigger for a migration of a plurality of local migration artifacts from a first deployment state for an on-premises network management system to a second deployment state; and seamlessly migrate the local migration artifacts from the first deployment state associated with the on-premises network management system to the second deployment state. The seamless migration includes reconciling at least one local migration artifact of the plurality of local migration artifacts with a plurality of remote migration artifacts maintained by a cloud-based provisioning system. The at least one local migration artifact may include at least one of a device inventory of the network devices managed by the on-premises network management system, certificates that the on-premises network management system will be providing to the network devices, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, and syslog messages that have been issued by the network management system.

Turning now to FIG. **1**, a networked computing system **100** in accordance with one or more examples of the subject matter claimed below is shown. The networked computing system **100** includes a number of network devices **105**. In this context, "network devices" include network devices that belong to the network infrastructure itself (e.g., capable of transmitting control plane frames), such as, switches, routers, access points, controllers, etc.) as opposed to devices that are managed by the network infrastructure. The network devices **105** may therefore include, for instance, one or more access points **110**, switches **115**, routers **120**, servers **125** (only one indicated): and firewalls **130** communicating over a network **135**, This list is neither exhaustive or limiting and other types of network devices **105** may be found in other examples.

The networked computing system **100** also includes a network management system ("network management system") **140** that, among other things, manages the operation and functionality of the network devices **105**. In some examples, the network management system **140** may be hosted on the premises **145**, and so may be referred to as an "on-premises network management system". The network management system **140** is a suite of software applications that are used to monitor, maintain, and control the software and hardware resources of the networked computing system **100**. The network management system **140** may monitor and manage the security, performance, and/or reliability of the network devices **105**. Performance and reliability of the network devices **105** may include, for instance, discovery, monitoring and management of the network devices **105** as well as analysis of network performance associated with the network devices **105** and providing alerts and notifications. The network management system **140** therefore may include one or more applications to implement these and other functionalities.

The network management system **140** creates and maintains a plurality of local migration artifacts **150**. The local migration artifacts **150** may include, for instance, a local device inventory **152** of the network devices **105**, local network data **153**, and a plurality of local device certificates **154**. This listing of local migration artifacts **150** is representative only and is neither exhaustive nor limiting. The local network data **153** may include, for instance, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, and syslog messages that have been issued by the network management system. Those in the art having the benefit of this disclosure will appreciate that the local migration artifacts **150** reside in one or more repositories—typically databases—on storage that is a part of the network **135**. The local migration artifacts **150** are created and maintained by the on-premises network management system **140** and therefor may be considered "local migration artifacts" because they are local relative to the network management system **140**.

The network management system **140** creates and maintains the local migration artifacts **150** during the operation of the networked computing system **100**. The local migration

artifacts **150** result, in part, from a process related to managing the networked computing system **100** called "provisioning". The manner in which provisioning occurs depends on the connection status of the on-premises network management system **140**. The on-premises network management system **140** may be "offline" or "online". "Offline" and "online" are defined relative to connection to a public network such as the public network **180** as described above. This connection status will also, affect how the reconciliation performed as a part of the seamless migration occurs.

For purposes of the present disclosure, "offline" means that the network devices **105** and/or the on-premises network management system **140** do not have access to a public network, such as the public network **180**. Because the network devices **105** and the on-premises network management system **140** do not have access to the Internet, they cannot use cloud-based provisioning services, such as the cloud-based provisioning service **160**. (The role of the cloud-based provisioning service **160** in provisioning is discussed below relative to the "online" connection status of the on-premises network management system **140**.)

Accordingly, when a new network device **105** is acquired, the on-premises network management system **140** updates the local migration artifacts **150**. More particularly, when the new network device **105** is first connected to the computing system **100**, the on-premises network management system **140** adds the new network device **105** into the local inventory **152**, enters the configuration and other information to the local network data **153**, and the device certificate **154** for the new network device **105** is acquired, retrieved and stored. The remote migration artifacts **170** may be separately maintained for the networked computer system **100** using a cloud-based provisioning service **160**.

To alleviate the difficulties of managing the networked computing system **100** when the on-premises network management system **140** is "offline", the on-premises network management system **140** may be placed "online". In this context, "online" means the network management system **140** has access to the public network **180** and cloud-based provisioning services **160**. Through communication with such cloud-based services **160**, the network management system **140** retrieves a validated list of network devices shipped to the proprietor.

For instance, when a new network device **105** is added to the networked computing system **100**, the new network device **105** is added to the local device inventory **152**, its configuration and other information is added to the local network data **153**, and the device certificate **154** is retrieved and stored. Once added, data regarding the new network device **105** and its operation may also be stored by the network management system **140** in the local network data **153**. When the new network device **105** is removed from the networked computing system **100**, the network management system **140** deletes it from the device inventory **152** as well as its associated data from the local network data **153** and its device certificate **154**.

The network management system **140** in some examples may use one or more cloud-based provisioning services **160** hosted on a cloud **165** to assist in provisioning the networked computing system **100**. The cloud **165** may be public or private but will generally be a private cloud. The cloud **165** will typically reside in a facility different from that in which the networked computing system **100** resides. The network management system **140** communicates with the cloud-based provisioning service **160** over a public network **180**. However, the subject matter below is not so limited. For instance, in some examples, the cloud **165** and the networked computing system **100** are separate systems but are nevertheless housed in the same facility, such as a data center.

In one example, a network management system can manage wired and wireless infrastructure and a wide range of third-party manufacturers, and provides granular visibility into devices, users and applications on the network. Through a centralized and intuitive user interface, the network management system can provide real-time monitoring, proactive alerts, historical reporting, and fast, efficient troubleshooting. Dedicated dashboard views quickly help view potential RF coverage issues, unified communications and collaboration ("UCC") traffic, application performance and network services health.

The network management system may be available as software or a combined hardware and software appliance. The network management system **140** may permit administrators and development and operations ("DevOps") professionals to access infrastructure and manage multiple generations of wired and wireless networks from just about many different vendors from controllerless to controller-managed and from legacy wireless local area network ("WLAN") to the latest generations of WLANs. As a part of this use, the network management system may maintain migration artifacts such as inventories, network data, and device certificates for the network devices of a proprietor.

The network management system **140** will track network devices **105** through the local migration artifacts **150** in its day-to-day operations. In general, the proprietor of the networked computing system **100** will acquire new network devices **105** from a vendor. The cloud-based provisioning service **160** tracks the network devices **105** of the networked computing system **100** as they are procured. The network management service **140** may be provided the associated information for those network devices **105** using the cloud-based provisioning service **160**.

To this end, the cloud-based provisioning service **160** maintains a plurality of remote migration artifacts **170** pertaining to the networked computing system **100**. This may result from the role of the cloud-based provisioning service **160** in provisioning the networked computing system **100** or from separate record keeping as new network devices **105** are provided to the networked computing system **100**. The remote migration artifacts **170** include, for instance, a remote device inventory **172** of the network devices **105**, remote network data **173**, and a plurality of remote device certificates **174**. The remote migration artifacts **170** do not reside on the networked computing system **100** and so may be considered "remote migration artifacts" for purposes of this disclosure.

The newly ordered network device **105** is automatically added to the remote device inventory **172** maintained by the cloud-based provisioning service **160**. The entry for the newly ordered network device **105** is associated with proper provisioning rules for the particular networked computing system **100**. Such association may be accomplished by placing device information for that particular network device into a folder associated with a desired set of rules to be followed.

The newly acquired, non-provisioned network device **105** is then factory-shipped to a targeted destination—the premises **145** in this example. A non-technical, person takes the network device out of the box and an event occurs (e.g., power-up and connection to a network; connection to a network; time-based in which a prescribed amount of time has elapsed; or return back to the first operating state). In its "non-provisioned state," the network device **105** has no

configuration settings and has no knowledge of a network device that is operating as its configuration device (e.g., network management server or a controller).

Upon connection, the network device **105** in the non-provisioned state retrieves its provisioning information from the cloud-based provisioning service **160**. (Remember, the network device **105** has already been added to the remote device inventory **172** and its associated information added to the remote network data **173**.) The network device **105** uses the provisioning information to obtain its configuration information from another network device **105** (not otherwise shown) operating as a configuration device. Depending on the mode of operation, such as where the network device **105** is operating as a virtual control device, the network device **105** may then push that configuration out to one or more other subordinate network devices **105** in the networked computing system **100**.

In contrast, in another operating (provisioned) state, the network device **105** is provided with rules that define how the device may contact its configuration device to retrieve information, such as firmware and configuration settings and in what configuration group the network device belongs. The rules may be provided by the cloud-based provisioning service **160** from, for example, the remote network data **173** artifact of the remote migration artifacts **170**. Or, the rules may be otherwise acquired. Furthermore, the rules may be used to automatically assign the network device **105** to specific geographical locations.

As a part of the provisioning for the network device **105**, the network management system **140** will download a device certificate **154** to the repository of the local migration artifacts **150**. The device certificate **154** may be obtained from the vendor from which the network device **105** was acquired. In this instance, the device certificate may be obtained through the cloud-based provisioning service **160**—e.g., by downloading the associated remote device certificate **174**. However, local device certificates **154** for network devices **105** can be obtained from a variety of sources. For instance, they may be obtained from third-parties or the client may provide one themselves.

The cloud-based provisioning service **160** automates the provisioning process, allowing a single administrator to deploy devices throughout a networked computing system. When the proprietor orders a new device from a vendor, that device is automatically added to the proprietor's remote device inventory **172** in the cloud-based provisioning serve. Once a device is in the device inventory, it can be automatically or manually associated to a folder and provisioning rule. An administrator connects the network device **105** to a public network **180** like the Internet, and that network device **105** will securely connect to the cloud-based provisioning service **160**, retrieve its provisioning information, then use the provisioning information to connect to its configuration device (not shown) and update its configuration. This process requires no human intervention, allowing for secure "zero-touch provisioning".

Accordingly, regardless of whether the network management system **140** is online or offline, the network management system **140** maintains the local migration artifacts **150** and the cloud-based provisioning service **160** maintains the remote migration artifacts **170**. However, one skilled in the art having the benefit of this disclosure will appreciate that there are a number of opportunities for the content of the local migration artifacts **150** to diverge from the content of the remote migration artifacts **170**. For instance, network devices **105** may be acquired from more than one vendor. The remote device inventory **172** maintained by each of the vendors for the networked computing system **100** will then differ from the local device inventory **152** kept by the network management system **140** of the networked computing system **100**. Similarly, if the proprietor of the networked computer system **100** provides its own device certificate **154**, or if the proprietor of the networked computing system **100** obtains a device certificate **154** from a third-party, then the local device certificate **154** will differ from the remote device certificate **174** maintained by the cloud-based provisioning system **160** in the remote migration artifacts **170**.

The present disclosure provides a technique by which the local migration artifacts **150** may be seamlessly migrated from one "deployment state" to a "second deployment state". The first deployment state is pre-migration and the second deployment state is post-migration in the illustrated examples. The deployment state is a function of connection status (i.e., whether the network management system **140** is online or offline) and the network management system location after migration (ie., on-premises, off-premises). In the examples disclosed herein, the first deployment state may be either offline or online depending on the example but will be on-premises. The second deployment state will be online but may be on-premises or off-premises depending on the example.

In examples in which the second deployment state is off-premises, the network management system **140** and local migration artifacts **150** may be, migrated to a cloud-based network management system **185**. The cloud-based network management system **185** is "off-premises" in the sense that it resides on a computing apparatus or a computing system (not otherwise shown) that is off the premises **145** on which the on-premises network management system **140** resides. In the particular examples shown herein, the migration off premises occurs over the public network **180**. Similarly, the execution of the technique will result in a set of migrated migration artifacts **190** in these examples. The migrated migration artifacts **190** include, for instance, a migrated device inventory **192**, a set of migrated network data **193**, and a set of device certificates **194** for the network devices **105** in the migrated device inventory **192**.

As a part of the migration process, the local migration artifacts **150** maintained by the on-premises network management system **140** are reconciled with the remote migration artifacts **170** maintained by the cloud-based provisioning service **160**. That is, a part of the process is an attempt to conform the content of post-migration artifacts to the content of the remote migration artifacts **170**. Note, however, that the technique does not always produce 100% conformity.

FIG. **2** illustrates a method **200** by which the seamless migration may be performed in some examples. The method **200** is a method managing a networked computing system. Referring now collectively to FIG. **1** and FIG. **2**, the method **200** begins by receiving (at **210**) a trigger for a migration of a plurality of local migration artifacts **150** from a first deployment state for an on-premises network management system **140** to a second, online deployment state. The trigger may be, for instance, an input from an administrator though the interface (not separately shown) of the on-premises network management system **140**.

Once triggered, the local migration artifacts **150** are seamlessly migrated (at **220**) from the first deployment state to a second, online deployment state. This seamless migration (at **220**) includes reconciling (at least one of the local migration artifacts **150** using a cloud-based provisioning system **160**. The reconciliation, that is a part of the seamless migration (at **220**) will depend, in the illustrated examples,

on whether the first deployment state is online or offline and whether the second deployment state is on-premises or off-premises.

For instance, consider the example of FIG. **3**, in which a network management system **305** of a networked computing system **300** is migrating from a first deployment state in which the on-premises network management system **305** is located on the premises **310** and is offline to a second deployment state in which the on-premises network management system **305** is still be on-premises **310** but is online. That is, pre-migration the network management system **305** is not connected to the public network **315** but is post-migration. So, the on-premises network management system **305** is provisioned in the first deployment state in which the on-premises network management system **305** is offline. The network devices **105** are added to the local device inventory **322** by the network management system **305** when they attempt to on-board the networked computing system **300** when first connected.

More particularly, in this example, when the proprietor acquires a new network device **105** and, because the on-premises network management system **305** is offline, the new network device **105** is provisioned using a pre-shared key-based ("PSK-based") process. An administrator adds the Dynamic Host Configuration Protocol ("DH CP") options to specify the network management system Internet Protocol ("IP") address. The administrator enters/ingests device details of all network devices **105**, including the new network device **105**. This information finds its way as appropriate into the local migration artifacts **320**, which include a local device inventory **322** of the network devices **105**, local network data **323**, and a plurality of local device certificates **324**. The network device **105** is connected and sends an on-boarding request to the on-premises network management system **305**. The on-premises network management system **305** then on-boards the network device **105** if it has been entered into the local device inventory **322**.

Note that the vendor has already generated the remote migration artifacts **330** that are maintained by the cloud-based provisioning service **335**. As discussed above, the remote migration artifacts **330** are developed and maintained by the vendor as new network devices **105** are procured and shipped. The remote migration artifacts **330** may include, for instance, a remote device inventory **332** of the network devices **105**, remote network data **333**, and a plurality of remote device certificates **334**. However, because the on-premises network management system **305** is offline, it cannot access the remote migration artifacts **330**.

The seamless migration begins when the proprietor chooses to move the on-premises network management system **305** from "offline" to "online" and triggers the seamless migration. This may be done, for instance, through an interface of the on-premises network management system **305**. However, the trigger may be executed in other ways in other examples. Once the trigger is communicated to the on-premises network management system **305**, the on-premises network management system **305** commences the seamless migration either by executing the seamless migration itself or calling another software component to execute the seamless migration. For instance, in some examples the seamless migration may be performed by service, application, or daemon that is called or invoked by the on-premises network management system **305**. In the illustrated examples, the functionality is integrated into the on-premises network management system **305** such that the on-premises network management system **305** executes the seamless migration itself.

The network management system **305** is then reconfigured to permit access to the public network **315** so that it can communicate with the cloud-based provisioning service **335**. The on-premises network management system **305** connects to the cloud-based provisioning service **335** and creates provisioning rules based on network management system Internet Protocol/Fully Qualified Domain Name ("IP/FQDN") for the proprietor's account to on board network devices **105** acquired from the vendor.

As mentioned above, the seamless migration includes a reconciliation of the local migration artifacts **320** with the remote migration artifacts **330**. In this migration, the local network data **323** and the remote network data **333** do not need reconciliation. In this migration, reconciliation is therefore only performed between the local device inventory **322** and the remote device inventory **332** as well as the local device certificates **324** and the remote device certificates **334**.

For device inventory reconciliation, the remote device inventory **332** will serve as the primary source of truth. That is, the remote device inventory **332** will be presumed to be accurate rather than the local device inventory **322** unless established otherwise. The on-premises network management system **305** retrieves the remote device inventory **332** from the cloud-based provisioning service **335** and compares the two inventories. For each network device **105** present in the remote device inventory **332**, if the network device **105** is omitted from the local device inventory **322**, the on-premises network management system **305** updates the local device inventory **322** to include the network device **105**.

If the network device **105** is present in the local device inventory **322** but, not the remote device inventory **332**, then on-premises network management system **305** begins a verification process. The on-premises network management system **305** continues to manage the network device **105** for a predetermined grace period (e.g., 15 days) while the verification proceeds. The on-premises network management system **305** then notifies the cloud-based provisioning **335** of the device inventory discrepancy and alerts the proprietor to on-board the network device **105**. Upon notification, the cloud-based provisioning service **335** then checks the remote device inventory **332**. If the network device **105** is omitted from the remote device inventory **332**, the cloud-based provisioning service **335** consults its, service access point ("SAP") to obtain the details of the network device **105**. If the omitted network device **105** belongs to the proprietor, then the omitted network device **105** is added to the remote device inventory **332** on, reconciliation with the Enterprise Device inventory and Procurement System ("EIPS"). If the omitted network device **105** does not belong to the proprietor, then the cloud-based provisioning service **335** notifies the on-premises network management system **305** and, after the predetermined grace period is automatically deleted unless the proprietor directly and manually intervenes.

The local device certificates **324** and the remote certificates **334** can then be reconciled once the local device inventory **322** and the remote device inventory **333** are reconciled. Generally, in on-premises, offline deployment, the proprietor uploads a server certificate signed by an issuer for device on-boarding and management. (An issuer can, be a locally managed enterprise issuer, a third-party issuer, or a self-signed certificate, etc.) However, in on-premises, online deployment, there can be also be more than one trusted device certificate **324** which may be combination of a certificate issued by the cloud-based provisioning service

335, a self-signed device certificate, or a third-party-based device certificate, for instance.

A new device certificate **324** may be made available from the cloud-based provisioning service **335**. As long as the on-premises network management system **305** is offline, the on-premises network management system **305** continues using the local device certificate **324** and the details it contains. When the network device **105** disconnects from the on-premises network management system **305** while it is offline and before it signs up onto the on-premises network management system **305** that is online, it downloads the new certificate from the cloud-based provisioning service **335**. The network device **105** will then connect to the on-premises network management system **305** with the new certificate when the deployment state is changed from on-premises offline to on-premises online.

The deployment state of the on-premises network management system **305** is then changed from on-premises, offline to on-premises, online.

Turning now to FIG. **4**, an example in which a plurality of migration artifacts **400** are seamlessly migrated from an on-premises, offline deployment state to an off-premises, online deployment state is illustrated. The local migration artifacts **400** reside in a networked computing system **405** on a premises **410**. The networked computing system **405** also includes an on-premises network management system **415**. The migration artifacts **400** are to be seamlessly migrated to a cloud-based network management system **420** residing off the premises **410** on a public network **430**, which process will result in the migrated migration artifacts **425**. The public network **430** may be, for instance, a public cloud.

More particularly, the local migration artifacts **400** may include, for instance, a local device inventory **402** of the network devices **105**, local network data **403**, and a plurality of local device certificates **404**. As described above, a cloud-based provisioning service **435** maintains a set of remote migration artifacts **440** that may include, for instance, a remote device inventory **442** of the network devices **105**, remote network data **443**, and a plurality of remote device certificates **444**. The seamless migration includes a reconciliation between the local migration artifacts **400** and the remote migration artifacts **440**, the local migration artifacts **400** then becoming the migrated migration artifacts **425**. The migrated migration artifacts **425** may include, for instance, a migrated device inventory **427** of the network devices **105**, migrated network data **428**, and a plurality of migrated device certificates **429**.

Again, in this example, the proprietor (not shown) of the networked computing system **405** is migrating the on-premises network management system **415** from a first deployment state in which the on-premises network management system **415** is located on the premises **410** and is offline to a second deployment state in which a cloud-based network management system **420** is off the premises **410** and is online. Furthermore, while pre-migration the on-premises network management system **415** is not connected to the public network **430**, post-migration the cloud-based network management system **420** will not only be online but will reside on the public network **430**. So, the proprietor provisions the on-premises network management system **415** in the first deployment state in which the on-premises network management system **415** is offline. The network devices **105** are added to the local device inventory **402** manually or the on-premises network management system **415** adds the network devices **105** when they attempt to on-board the networked computing system **405** when first connected.

More particularly, in this example, when the proprietor acquires a new network device **105**, because the on-premises network management system **415** is offline, the new network device **105** is provisioned using a pre-shared key-based ("PSK-based") process. An administrator adds the Dynamic Host Configuration Protocol ("DHCP") options to specify the network management system Internet Protocol ("IP") address. The administrator enters/ingests device details of all network devices **105**, including the new network device **105**. This information finds its way as appropriate into the local migration artifacts **400**, which include a local device inventory **402** of the network devices **105**, local network data **403**, and a plurality of local device certificates **404**. The network device **105** is connected and sends an on-boarding request to the on-premises network management system **415**. The on-premises network management system **415** then on-boards the network device **105** if it has been entered into the local device inventory **402**.

Note that the vendor has already generated the remote migration artifacts **440** that are maintained by the cloud-based provisioning service **435**. As discussed above, the remote migration artifacts **440** are developed and maintained by the vendor as new network devices **105** are procured and shipped. However, because the on-premises network management system **415** is offline, it cannot access the remote migration artifacts.

The seamless migration begins when the proprietor chooses to move the local migration artifacts **400** from "offline" to "online" and "off-premises" and triggers the seamless migration. This may be done, for instance, through an interface of the on-premises network management system **415**. However, the trigger may be executed in other ways in other examples. Once the trigger is communicated to the on-premises network management system **415**, the on-premises network management system **415** commences the seamless migration either by executing the seamless migration itself or calling another software component to execute the seamless migration. For instance, in some examples the seamless migration may be performed by service, application, or daemon that is called or invoked by the on-premises network management system **415**. In the illustrated examples, the functionality is integrated into the on-premises network management system **415** such that the on-premises network management system **415** executes the seamless migration itself.

The on-premises network management system **415** is then reconfigured to permit access to the public network **430** so that it can communicate with the cloud-based provisioning service **435**. The on-premises network management system **415** connects to the cloud-based provisioning service **435** and creates provisioning rules base on network management system IP/FQDN for the proprietor's account to on board network devices **105** acquired from the vendor.

As mentioned above, the seamless migration includes a reconciliation of the local migration artifacts **400** with the remote migration artifacts **440**. In this migration, unlike the example of FIG. **3**, the local network data **403** and the remote network data **443** are reconciled. In this migration, reconciliation is also performed between the local device inventory **402** and the remote device inventory **442**. However, there is no reconciliation between the local device certificates **404** and the remote device certificates **444**. The reconciled local migration artifacts **400** then become the migrated migration artifacts **425** that are maintained, by the cloud-based network management system **420**.

The cloud-based network management system **420** may obtain a copy (not shown) of the local device inventory **402**

from a backup/restore operation performed prior to the reconciliation. If a comparison of the local device inventory **402** and the remote device inventory **442** produces any network devices **105** in the remote device inventory **442** but not in the local device inventory **402**, the cloud-based network management system **420** will download those network devices **105** and any associated information from the remote device inventory **442** and into the copy of the local device inventory **402**.

If the network device **105** is present in the local device inventory **402** but, not the remote device inventory **427**, then cloud-based network management system **420** begins a verification process. The cloud-based network management system **420** continues to manage the network device **105** for a predetermined grace period (e.g., 15 days) while the verification proceeds. The cloud-based network management system **420** then notifies the cloud-based provisioning service **435** of the device inventory discrepancy and alerts the proprietor to on-board the network device **105**. Upon notification, the cloud-based provisioning service **435** then checks the remote device inventory **442**. If the network device **105** is omitted from the remote device inventory **442**, the cloud-based provisioning service **435** consults its EPS to obtain the device detail. If the omitted network device **105** belongs to the proprietor, then the omitted network device is added to the remote device inventory **442** on reconciliation with the EIPS. If the omitted network device **105** does not belong to the proprietor, then the cloud-based provisioning service **435** notifies the cloud-based network management system **420** and, after the predetermined grace period is automatically deleted unless the proprietor directly and manually intervenes. Once the device inventory reconciliation is finished, the reconciled copy of the local device inventory **402** becomes the migrated device inventory **427**.

Once the device inventory reconciliation is performed the local network data **403** and the remote network data **443** may be reconciled. Again, the cloud-based network management system **420** may obtain a copy (not shown) of the local network data **403** through a previously performed backup/restore operation. Reconciliation of network data includes, for instance, reconciliation of various applications whose execution is overseen by the on-premises network management system **415**. The reconciliation can be handled using existing data backup and migration workflows that have previously been defined in the on-premises network management system **415**. Backup and restore may be performed, for instance, with interfacing with the data store engine (not shown) of the network management system **415** at the Data Manipulation Language ("CAL") or Data Definition Language ("DDL") level.

The deployment state is then changed from on-premises, offline to off-premises, online. This will include in this particular example shifting the connection of the network devices **105** of the networked computing system **405** from the on-premises network management system **400** to the cloud-based network management system **420**. This will, in turn, include disconnecting the network devices **105** from the network management system **400** and then connecting them with the cloud-based network management system **420**.

Referring now to FIG. **5**, in this example a plurality of migration artifacts **500** are seamlessly migrated from an on-premises, online deployment state to an off-premises, online deployment state. The local migration artifacts **500** reside in a networked computing system **505** on a premises **510**. The networked computing system **505** also includes an on-premises network management system **515**. The migration artifacts **500** are to be seamlessly migrated to a cloud-based network management system **520** residing off the premises **510** on a public network **530**, which process will result in the migrated migration artifacts **525**. The public network **530** may be, for instance, a public cloud.

More particularly, the local migration artifacts **500** may include, for instance, a local device inventory **502** of the network devices **105**, local network data **503**, and a plurality of local device certificates **504**. As described above, a cloud-based provisioning service **535** maintains a set of remote migration artifacts **540** that may include, for instance, a remote device inventory **542** of the network devices **105**, remote network data **543**, and a plurality of remote device certificates **544**. The seamless migration includes a reconciliation between the local migration artifacts **500** and the remote migration artifacts **540**, the local migration artifacts **500** then becoming the migrated migration artifacts **525**. The migrated migration artifacts **525** may include, for instance, a migrated device inventory **527** of the network devices **105**, migrated network data **528**, and a plurality of migrated device certificates **529**.

One difference between the example of FIG. **5** and the examples of FIG. **3** and FIG. **4** is that the on-premises network management system **515** is online. This means that the on-premises network management system **515** has access to the cloud-based provisioning, service **535**. Thus, the provisioning of the network devices **105** in the networked computing system **505** need not be performed manually. The on-premises network management system **515** can download all the information needed for provisioning directly from the cloud-based provisioning service. This may include the on-premises network management system **515** accessing the public network **530** so that it can communicate with the cloud-based provisioning service **335**. The on-premises network management system **515** connects to the cloud-based provisioning service **535** and creates provisioning rules base on network management system Internet IP/FQDN for the proprietor's account to on board network devices **105** acquired from the vendor.

As mentioned above, the seamless migration includes a reconciliation of the local migration artifacts **500** with the remote migration artifacts **540**. In this migration, unlike the examples of FIG. **3** and FIG. **4**, the local device inventory **502** need not be reconciled since it is largely drawn from the remote device inventory **542**. Similarly, local device certificates **504** are not reconciled with remote device certificates **544** since they are downloaded through the cloud-based provisioning service **535**. However, the local network data **503** is reconciled with the remote network data **543**. The reconciled local migration artifacts **500** then become the migrated migration artifacts **525** that are maintained by the cloud-based network management system **520**.

For data reconciliation, the cloud-based network management system **520** may obtain a copy (not shown) of the local network data **503** through a previously performed backup/restore operation. Reconciliation of network data includes, for instance, reconciliation of various applications whose execution is overseen by the on-premises network management system **515**. The reconciliation can be handled using existing data backup and migration workflows that have previously been defined in the on-premises network management system **515**. Backup and restore may be performed, for instance, with interfacing with the data store engine (not shown) of the network management system **515** at the DML or DDL level.

The deployment state is then changed from on-premises, online to off-premises, online. This will include shifting the

connection of the network devices **105** of the networked computing system **505** from the on-premises network management system **500** to the cloud-based network management system **520**. This will, in turn, include disconnecting the network devices **105** from the network management system **500** and then connecting them with the cloud-based network management system **520**.

Those in the art having the benefit of the disclosure will appreciate still other examples not illustrated herein. For instance, in the example of FIG. **4** the cloud-based network management system **420** to which the local migration artifacts **400** are seamlessly migrated resides on, a public network **430**. However, in some examples, the public network **430** may instead by a private network, such as a private cloud. And, in some of these examples, the private network may reside on the premises **410**. So, the migration may be between a first online or offline, on-premises deployment state to a second, online, on-premises or off-premises deployment state.

Returning to FIG. **1**, the on-premises network management system **140** and local migration artifacts **150** may be hosted on an administrative console such as the administrative console **600** in FIG. **6**. FIG. **6** illustrates selected portions of a hardware and software architecture of an administrative console as may be used in one or more examples. In this particular example, the administrative console **600** hosts the on-premises network management system **140** as well as the local migration artifacts **150**, including the local device inventory **152** of the network devices **105**, the local network data **153**, and the plurality of local device certificates **154**. The administrative console **600** also includes a processing resource **605**, a memory **610**, and a user interface **615**, all communicating over a communication system **620**. The processing resource **605** and the memory **610** are in electrical communication over the communication system **620** as are the processing resource and the peripheral components of the user interface **615**.

The processing resource **605** may be a processor, a processing chipset, or a group of processors depending upon the implementation of the administrative console **600**. The memory **610** may include some combination of read-only memory ("ROM") and random-access memory ("RAM") implemented using, for instance, magnetic or optical memory resources such as magnetic disks and optical disks. Portions of the memory **610** may be removable. The communication system **620** may be any suitable implementation known to the art. In this example, the administrative console **600** is a stand-alone computing apparatus. Accordingly, the processing resource **605**, the memory **610** and user interface **615** are all local to the administrative console **600** in this example. The communication system **620** is therefore a bus system and may be implemented using any suitable bus protocol.

The memory **610** is encoded with an operating system **625** and user interface software **630**. The user interface software ("UIS") **630**, in conjunction with a display **635**, implements the user interface **615**. The user interface **615** includes a dashboard (not separately shown) displayed on a display **635**. The user interface **615** may also include other peripheral I/O devices such as a keypad or keyboard **645** and a mouse **650**. In, some examples, the screen of the display **635** may be a touchscreen so that the peripheral I/O devices may be omitted.

Note that in FIG. **6** the user interface software **630** is shown separately from the network management system **140**. As mentioned above, in some embodiments the user interface software **630** may be integrated into and be a part of the network management system **140**. Similarly, the local migration artifacts **150** are shown separately from the network management system **140** but may, in some examples, be considered a constituent part of the network management system **140**. Still further, as discussed above, the network management system **140** may comprise a suite of applications or other software components. These software components need not all be located on the same computing apparatus and may, in some examples, be distributed across the networked computing system **100**. Similarly, the local migration artifacts **150** may also by distributed across the networked computing system **100** rather than stored collectively on a single computing apparatus. Furthermore, in some examples, the seamless migration functionality may be implemented by a separate software component invoked or called by the network management system **140**, or invoked or called by an administrator through the network management system **140**.

The processing resource **605** runs under the control of the operating system **625**, which may be practically any operating system. The network management system **140** is invoked by a user through the dashboard, the operating system **625** upon power up, reset, or both, or through some other mechanism depending on the implementation of the operating system **625**. The network management system **140**, when invoked, performs the method **200** illustrated in FIG. **2** and discussed above.

The presently disclosed seamless migration technique provides many practical applications and improvements for the networked computing systems on which it is employed. For example, they provide a faster upgrade cycles and patch deliveries in examples in which the local artifacts are migrated off-premises to a cloud. This is because they are owned and managed by Development and Operations ("DevOps") team manages the public cloud round-the-clock. The persistent presence and service of the DevOps team ensures better overall network health monitoring, quicker issue detection and resolution.

The seamless migration technique also improves network readiness because of the increased ability to obtain certificates and device-device inventory lists from cloud-based provisioning services. This feature also eases device on-boarding and reduces error introduced by manual provisioning. The technique also improves beta feature availability to providers interested in testing new and upcoming features. Still other practical applications and improvements in operation will become apparent to those skilled in the art having the benefit of this disclosure.

The figures set forth herein aid in depicting various architectures, functionalities, and operations of the examples disclosed herein. Throughout the description, many of the elements are defined, at least in part, as programs, programming, or program instructions. Each of these elements, portions thereof, or various combinations thereof may represent in whole or in part a module, segment, or portion of code that includes one or more executable instructions to implement any specified logical function(s). Each element or various combinations thereof may represent a circuit or a number of interconnected circuits to implement the specified logical function(s).

Some portions of the detailed descriptions herein are presented in terms of a software implemented process involving symbolic representations of operations on data bits within a memory in a computing system or a computing device. These descriptions and representations are the means used by those in the art to most effectively convey the substance of their work to others skilled in the art. The

process and operation require, physical manipulations of physical quantities that will physically transform the particular machine or system on which the manipulations are performed or on which the results are stored. Usually, though not necessarily, these quantities take the form of electrical, magnetic, or optical signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like.

It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated or otherwise as may be apparent, throughout the present disclosure, these descriptions refer to the action and processes of an electronic device, that manipulates and transforms data represented as physical (electronic, magnetic, or optical) quantities within some electronic device's storage into other data similarly represented as physical quantities within the storage, or in transmission or display devices. Exemplary of the terms denoting such a description are, without limitation, the terms "processing," "accessing", "computing," "calculating," "determining," "displaying," and the like.

Furthermore, the execution of the software's functionality transforms the computing apparatus on which it is performed. For example, acquisition of data will physically alter the content of the storage, as will subsequent processing of that data. The physical alteration is, a "physical transformation" in that it changes the physical state of the storage for the computing apparatus.

The examples disclosed herein may be realized in any non-transitory, tangible computer-readable media for use by or in connection with an instruction execution system, such as, a computer/processor-based system, or an Application Specific Integrated Circuit ("ASIC"), or another system that can fetch or obtain the logic from computer-readable media and execute the instructions contained therein. Non-transitory, tangible computer-readable media may be any media that is capable of containing, storing, or maintaining programs and data for use by or in connection with the computing systems disclosed herein. Computer readable media may include any one of many physical media such as, for example, electronic, magnetic, optical, electromagnetic, or semiconductor media.

More specific examples of suitable computer-readable media include a portable magnetic computer diskette such as floppy diskettes or hard drives, a random-access memory ("RAM"), a read-only memory ("ROM"), an erasable programmable read-only memory ("EPROM"), or a portable compact disk ("CD"), digital video disk ("DVD"), or flash drive. Similarly, the transmission medium may be twisted wire pairs, coaxial cable, optical fiber, or some other suitable transmission medium known to the art. The technique is not limited by these aspects of any given implementation.

This concludes the detailed description. The particular examples disclosed above are illustrative only, as examples described herein may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular examples disclosed above may be altered or modified and all such variations are considered within the scope and spirit of the appended claims. Accordingly, the protection sought herein is as set forth in the claims below.

What is claimed is:

1. A method for use in managing a networked computing system, comprising:

receiving a trigger for a migration of a plurality of local migration artifacts from a first deployment state associated with an on-premises network management system to a second deployment state associated with a cloud-based provisioning system;

migrating the plurality of local migration artifacts from the first deployment state associated with the on-premises network management system to the second deployment state associated with the cloud-based provisioning system, the migration being seamless and including reconciling at least one local migration artifact of the plurality of local migration artifacts with a plurality of remote migration artifacts maintained by the cloud-based provisioning system, wherein the at least one local migration artifact includes local device inventory of a plurality of network devices managed by the on-premises network management system, and at least one of: certificates that the on-premises network management system is to provide to the network devices, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, or syslog messages that have been issued by the network management system; and

managing the networked computing system based on the local device inventory for a predetermined period of time in response to a discrepancy between the local device inventory and a remote device inventory associated with the cloud-based provisioning system.

2. The method of claim **1**, wherein the second deployment state is online and off-premises.

3. The method of claim **2**, wherein seamlessly migrating the plurality of local migration artifacts from the first deployment state associated with the on-premises network management system to the second deployment state includes:

seamlessly migrating the plurality of local migration artifacts from the on-premises network management system to a cloud-based network management system; and

shifting a connection of a plurality of network devices with which the plurality of local migration artifacts are associated from the on-premises network management system to the cloud-based network management system.

4. The method of claim **1**, wherein:

the first deployment state is offline and on-premises and the second deployment state is online and on-premises;

the plurality of local migration artifacts include a local device inventory and a plurality of local device certificates;

the plurality of remote migration artifacts include a remote device inventory and a plurality of remote device certificates; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes:

reconciling the local device inventory of the on-premises network management system and the remote device inventory of the cloud-based provisioning service; and

reconciling the local device certificates and the remote device certificates.

5. The method of claim 1, wherein:

the first deployment states is offline and on premises and the second deployment state is online and off-premises;

the plurality of local migration artifacts include a local device inventory and a plurality of local network data;

the plurality of remote migration artifacts include a remote device inventory and a plurality of remote network data; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes:

reconciling the local device inventory and the remote device inventory; and

reconciling network data between the on-premises network management system and the cloud-based provisioning service upon reconciliation of the local device inventory and the remote device inventory.

6. The method of claim 1, wherein:

the first deployment state is online and on-premises and the second deployment state is online and off-premises;

the plurality of local migration artifacts include a plurality of local network data;

the plurality of remote migration artifacts include a plurality of remote network data; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes reconciling the local network data and the remote network data.

7. A networked computing system, comprising:

a plurality of network devices;

an on-premises network management system that, in operation, manages the plurality of network devices and includes software component that, upon receiving a trigger:

seamlessly migrates a plurality of local migration artifacts from a first deployment state associated with the on-premises network management system to a second deployment state associated with a cloud-based provisioning system, the seamless migration including reconciling at least one local migration artifact of the plurality of local migration artifacts with a remote migration artifact of a plurality of remote migration artifacts maintained by the cloud-based provisioning system, wherein the at least one local migration artifact includes a local device inventory of the network devices managed by the on-premises network management system, and at least one of: certificates that the on-premises network management system is to provide to the network devices, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, or syslog messages that have been issued by the network management system; and

manages the networked computing system based on the local device inventory for a predetermined period of time in response to a discrepancy between the local device inventory and a remote device inventory associated with the cloud-based provisioning system.

8. The networked computing system of claim 7, wherein the software component is integrated into the on-premises network management system.

9. The networked computing system of claim 7, wherein the software component is an application, a service, or a daemon.

10. The networked computing system of claim 7, wherein the second deployment state is online and off-premises.

11. The networked computing system of claim 10, wherein the seamless migration includes:

seamlessly migrating the plurality of local migration artifacts from the on-premises network management system to a cloud-based network management system; and

shifting the connection of the plurality of network devices with which the plurality of local migration artifacts are associated from the on-premises network management system to the cloud-based network management system.

12. The networked computing system of claim 7, wherein:

the first deployment state is offline and on-premises and the second deployment state is online and on-premises;

the plurality of local migration artifacts include a local device inventory and a plurality of local device certificates;

the plurality of remote migration artifacts include a remote device inventory and a plurality of remote device certificates; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes:

reconciling the local device inventory of the on-premises network management system and the remote device inventory of the cloud-based provisioning service; and

reconciling the local device certificates and the remote device certificates.

13. The networked computing system of claim 7, wherein:

the first deployment states is offline and on premises and the second deployment state is online and off-premises;

the plurality of local migration artifacts include a local device inventory and a plurality of local network data;

the plurality of remote migration artifacts include a remote device inventory and a plurality of remote network data; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes:

reconciling the local device inventory and the remote device inventory; and

reconciling network data between the on-premises network management system and the cloud-based provisioning service upon reconciliation of the local device inventory and the remote device inventory.

14. The networked computing system of claim 7, wherein:

the first deployment state is online and on-premises and the second deployment state is online and off-premises;

the plurality of local migration artifacts include a plurality of local network data;

the plurality of remote migration artifacts include a plurality of remote network data; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes reconciling the local network data and the remote network data.

15. A computing apparatus, comprising:

a processing resource;

a bus system; and

a memory that, in operation, communicates with the processing resource over the bus system and is encoded

with instructions that, when executed by the processing resource over the bus system, cause the processing resource to:

receive a trigger for a migration of a plurality of local migration artifacts from a first deployment state for an on-premises network management system to a second deployment state associated with a cloud-based provisioning system;

seamlessly migrate the local migration artifacts from the first deployment state associated with the on-premises network management system to the second deployment state associated with the cloud-based provisioning system, the seamless migration including reconciling at least one local migration artifact of the plurality of local migration artifacts with a plurality of remote migration artifacts maintained by the cloud-based provisioning system, wherein the at least one local migration artifact includes a local device inventory of the network devices managed by the on-premises network management system, and at least one of: certificates that the on-premises network management system is to provide to the network devices, monitoring statistics about the network devices managed by the network management system, alerts that have been issued by the network management system, or syslog messages that have been issued by the network management system; and

manage the networked computing system based on the local device inventory for a predetermined period of time in response to a discrepancy between the local device inventory and a remote device inventory associated with the cloud-based provisioning system.

16. The networked computing system of claim **15**, wherein:

the first deployment state is offline and on-premises and the second deployment state is online and on-premises;

the plurality of local migration artifacts include a local device inventory and a plurality of local device certificates;

the plurality of remote migration artifacts include a remote device inventory and a plurality of remote device certificates; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes:

reconciling the local device inventory of the on-premises network management system and the remote device inventory of the cloud-based provisioning service; and

reconciling the local device certificates and the remote device certificates.

17. The computing apparatus of claim **15**, wherein:

the first deployment states is offline and on premises and the second deployment state is online and off-premises;

the plurality of local migration artifacts include a local device inventory and a plurality of local network data;

the plurality of remote migration artifacts include a remote device inventory and a plurality of remote network data; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes:

reconciling the local device inventory and the remote device inventory; and

reconciling network data between the on-premises network management system and the cloud-based provisioning service upon reconciliation of the local device inventory and the remote device inventory.

18. The computing apparatus of claim **15**, wherein:

the first deployment state is online and on-premises and the second deployment state is online and off-premises;

the local migration artifacts include a plurality of local network data;

the remote migration artifacts include a plurality of remote network data; and

reconciling the at least one local migration artifact of the plurality of local migration artifacts with the plurality of remote migration artifacts includes reconciling the local network data and the remote network data.

19. The method of claim **1**, wherein the discrepancy between the local device inventory and the remote device inventory includes a network device present in the local device inventory and not present in the remote device inventory, and wherein the network device is deleted from the remote device inventory after the predetermined period of time.

20. The method of claim **1**, wherein the discrepancy between the local device inventory and the remote device inventory includes a network device present in the remote device inventory and not present in the local device inventory, and wherein the local device inventory is automatically updated to include the network device.

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